REMARKS

Status of the Claims

Claims 1–8 are currently pending. All claims were amended. Added material has been underlined, while deleted material has been marked by a single strikethrough. No new matter has been added.

Rejection under 35 U.S.C. § 102(b)

Claims 1, 3, and 5-8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Chow (U.S. Pat. No. 5,240,749). Applicants respectfully disagree.

Claim 1 has been amended to clarify that the pulsed discharge is a repeated succession of a low-power state and a high-power state; *i.e.*, the pulsed discharge cannot be only a succession of one low-power state and one high-power state. This amendment is supported by the specification as filled; particularly by paragraphs [0046]-[0048], [0054], and [0059]. Applicants also note that the power generated by the microwave generator is periodic with time; however, the signal is not necessarily strictly periodic.

First, the Patent Office asserts that the American Heritage Dictionary (4th Edition, Houghton Mifflin Company, 2000) defines a pulse as "a brief sudden change in a normally constant quantity". The Office, however, disregards the full meaning of "pulse", which is clearly defined as a brief and sudden change or a series of intermittent occurrences:

> 3. *Physics*
> a. A brief sudden change in a normally constant quantity: *a pulse of current; a pulse of radiation.*
> b. Any of a series of intermittent occurrences characterized by a brief sudden change in a quantity. (Emphasis added)

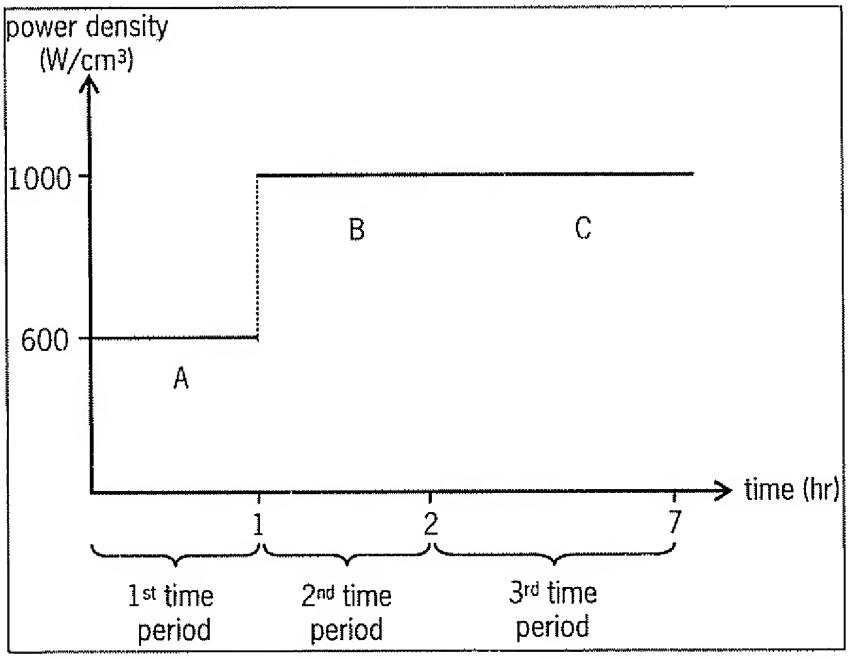
Further, Dictionary.com defines a pulse in Physics as (*Dictionary.com Unabridged (v 1.1)*; Random House, Inc.; http://dictionary.reference.com/browse/pulse, accessed on April 2, 2007):

> 6. *Physics.* a single, abrupt emission of particles or radiation.
> 12. *Physics.* to emit particles or radiation periodically in short bursts. (Emphasis added)

As amended claim 1 discloses that the gas is subjected to periodic pulsed discharges. In light of the above definitions, the concept of "periodic pulsed discharges" should be considered to be: 1) a *brief and abrupt change* of power density applied to the gas, and 2) the *series of*

occurrences of said pulses are *repetitive and periodic*. On the other hand, the application of two successive power states for a long period of time, such as several seconds or more, is not considered a pulse discharge. These power states should be considered *plateaus*.

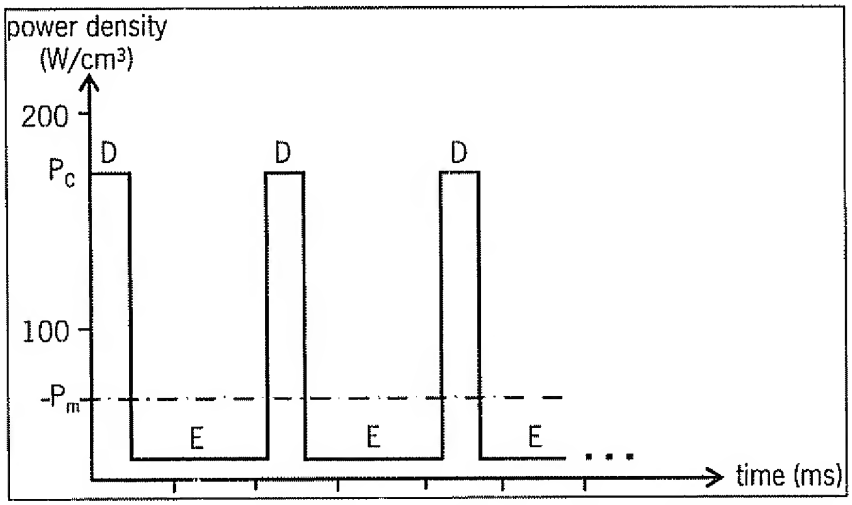
With respect to novelty, Chow does not disclose a pulsed discharge of power. Chow clearly applies <u>two</u> successive, constant power densities: the first occurs in the 1st step and has duration of one hour; and the second has the higher power level than the first and occurs in the 2nd and 3rd step (duration of one hour in the 2nd, and duration of five to six hours in the 3rd step). Please see Chow Figure bellow:



Chow Figure: technical effect <u>A</u> forms diamond-like ball; technical effect <u>B</u> forms diamond faces on top of the diamond-like ball; and technical effect <u>C</u> causes the faces on top of the particles to be joined together into a semi-continuous diamond.

Chow discloses that the transition between the two power densities is done by only <u>one</u> "increase" (claim 1, lines 17-23). Chow does not disclose that this "increase" is *brief* or *sudden*, nor that is *abrupt* or *periodical in short burst*. Chow does not disclose nor suggest that said two power densities are repeated. That is, they cannot be considered to be periodic, since they don't recur at intervals of time. Thus, according to the above definitions, Chow's "increase" cannot qualify as "pulsed discharge" since it is neither abrupt nor brief.

Contrary to Chow, the current invention comprises the additional feature of applying periodic pulsed discharges, forming a repeated succession of a low-power state and a high-power state. Please see Invention Figure bellow:



Invention Figure: technical effect of *D* increases the characteristics of the plasma (high concentration of atoms H and C-containing radicals), thus high deposition rate; and technical effect of *E* decreases the mean power of discharge, thus the wall temperature remain low and less H-atoms recombine.

This additional feature aims at improving the growth rate of the diamond films manufacturing. Indeed, due to the repeated succession of the low-power states and high-power states, the walls of the chambers do not heat up. This prevents H-atoms from recombining, thus their concentration remains higher in the plasma. Consequently, as H-atoms constitute activators of the reaction, the diamond film may be deposited at a higher rate for a constant power consumed.

In order to obtain the method of the present invention and having the Chow reference at hand, a person skilled in the art would need to, at least:

1. substantially decrease the duration of each plateau, from about 1h to a few ms,
2. repeat, for a time to determine, the application of a low-power state and a high-power state, in order to obtain a periodic signal, forming a repeated succession of a low-power state and a high-power state, and
3. determine, according to the conditions of the invention and the desired growth rate, the respective power densities of the low-power state and the high-power state, as well as the ratio of their duration,

since Chow discloses a method for growing a diamond film on a selected substrate, wherein power densities are applied increasingly by stair steps on an hour time scale. Accordingly, a person of skill in the art would need to perform a great number of experiments, calculations and simulations on the plasma modelling to modify the method disclosed by Chow in order to obtain the claimed method. This implies that the technical differences between Chow and the claimed method are not obvious. (Chow's method has the same deficiencies as the prior art described on page 1, lines 8-17 of this application).

Further, nothing in Chow suggests the existence of the technical problem caused by warming of the apparatus walls. Chow does not indicate how to solve this problem; in fact, Chow does not even mention it. One must conclude that either Chow does not solve this problem or Chow's method involves a means to cool the walls (please see the Background of the Invention section). Indeed, if Chow does not cool the walls of the chamber the recombination of H-atoms increases. Under these conditions, a diamond film that has good surface characteristics is obtained, but with a low rate of manufacturing. On the other hand, the present invention aims at improving low rates of manufacturing.

In view of the foregoing, the applicants respectfully request reconsideration and withdrawal of the § 102(b) rejections of claims 1, 3, and 5-8.

Rejection under 35 U.S.C. § 103(a)

Claims 2, 4, and 7-8 stand rejected under 35 U.S.C. § 103(a) as being anticipated by Chow (U.S. Pat. No. 5,240,749) in view of Kawarada *et al* (JP 01157496). Applicants respectfully disagree.

In light of the above arguments, Applicants submit that Chow does not disclose or suggests the currently claimed method for the manufacturing of a diamond film. Kawarada *et al.* with its general teachings, does not cure these deficiencies. Thus, claims 2, 4, and 7-8 are not obvious in light of Chow and Kawarada *et al.*, and the applicants respectfully request that the § 103(a) rejection be withdrawn.

CONCLUSION

Applicants respectfully contend that all requirements of patentability have been met. Allowance of the claims and passage of the case to issue are therefore respectfully solicited. The Examiner is urged to contact the Applicants' undersigned representative at (312) 913-2114 if the Examiner believes a discussion would expedite prosecution of this application.

Respectfully submitted,

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